

Listing of Claims:

1-38. (Cancelled)

39. (New) A fibrous substrate comprising:

nanoparticles having a surface area of at least about 50 square meters per gram, wherein the nanoparticles are modified with a metal ion and have a negative zeta potential prior to modification with the metal ion; and

a binder that durably adheres the modified nanoparticles to the substrate.

40. (New) The substrate of claim 39, wherein the negative zeta potential is from about -1 millivolt to about -50 millivolts.

41. (New) The substrate of claim 39, wherein the zeta potential of the modified nanoparticles is greater than the zeta potential of the nanoparticles prior to modification.

42. (New) The substrate of claim 41, wherein the zeta potential of the modified nanoparticles is from about -5 millivolts to about -15 millivolts.

43. (New) The substrate of claim 39, wherein the metal ion is adsorbed onto a surface of the nanoparticles.

44. (New) The substrate of claim 39, wherein the metal ion forms a coordinate or covalent bond with the nanoparticles.

45. (New) The substrate of claim 39, wherein the nanoparticles have a surface area of at least about 100 square meters per gram.

46. (New) The substrate of claim 39, wherein the nanoparticles have a size of less than about 500 nanometers.

47. (New) The substrate of claim 39, wherein the nanoparticles comprise silica.

48. (New) The substrate of claim 39, wherein the metal ion includes copper, silver, gold, iron, manganese, or combinations thereof.

49. (New) The substrate of claim 39, wherein the substrate contains polyolefin fibers.

50. (New) The substrate of claim 39, wherein the substrate is a spunbond web, meltblown web, or combination thereof.

51. (New) The substrate of claim 39, wherein the substrate contains cellulosic fibers.

52. (New) The substrate of claim 39, wherein the modified nanoparticles constitute from about 0.1 to about 10 wt.% of the substrate.

53. (New) The substrate of claim 39, wherein the binder constitutes from about 0.01 to about 5 wt.% of the substrate.

54. (New) A personal care product comprising the substrate of claim 39.

55. (New) Protective barrier clothing comprising the substrate of claim 39.

56. (New) The substrate of claim 39, wherein the nanoparticles and binder are sequentially applied to the substrate.

57. (New) A fibrous substrate comprising;
first nanoparticles having a surface area of at least about 50 square meters per gram, wherein the first nanoparticles are modified with a metal ion and have a negative zeta potential prior to modification with the metal ion; and
second nanoparticles having a positive zeta potential that durably adhere the modified nanoparticles to the substrate.

58. (New) The substrate of claim 57, wherein the second nanoparticles have a zeta potential of from about 1 millivolt to about 70 millivolts.

59. (New) The substrate of claim 57, wherein the first nanoparticles have a zeta potential of from about -1 millivolt to about -50 millivolts prior to modification with the metal ion.

60. (New) The substrate of claim 57, wherein the zeta potential of the modified nanoparticles is greater than the zeta potential of the first nanoparticles prior to modification.

61. (New) The substrate of claim 60, wherein the zeta potential of the modified particles is from about -5 millivolts to about -15 millivolts.

62. (New) The substrate of claim 57, wherein the metal ion is adsorbed onto a surface of the first nanoparticles.

63. (New) The substrate of claim 57, wherein the metal ion forms a coordinate or covalent bond with the first nanoparticles.

64. (New) The substrate of claim 57, wherein the first nanoparticles have a surface area of at least about 100 square meters per gram.

65. (New) The substrate of claim 57, wherein the first and second nanoparticles have a size of less than about 500 nanometers.

66. (New) The substrate of claim 57, wherein the first nanoparticles comprise silica.

67. (New) The substrate of claim 57, wherein the second nanoparticles comprise alumina.

68. (New) The substrate of claim 67, wherein the alumina is coated onto silica.

69. (New) The substrate of claim 57, wherein the metal ion includes copper, silver, gold, iron, manganese, or combinations thereof.

70. (New) The substrate of claim 57, wherein the substrate contains polyolefin fibers.

71. (New) The substrate of claim 57, wherein the substrate is a spunbond web, meltblown web, or combination thereof.

72. (New) The substrate of claim 57, wherein the substrate contains cellulosic fibers.

73. (New) The substrate of claim 57, wherein the modified nanoparticles constitute from about 0.1 to about 10 wt.% of the substrate.

74. (New) A personal care product comprising the substrate of claim 57.

75. (New) Protective barrier clothing comprising the substrate of claim 57.